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"Testing the association between bone mineral density and surgical outcomes for TKA patients"

Introduction: Osteoporosis is a disease that affects the bone quality for millions of individuals. 54% of Americans over the age of 50 suffer from osteoporosis, or low bone mineral density (BMD). Recently, we observed a lack of bone density screening in our cohort of total knee arthroplasty (TKA) patients. TKA is a deconstructive, surgical procedure which is typically used to counter osteoarthritis within the knee. The TKA procedure can be altered during surgery to account for differences in BMD, and drugs like bisphosphonates can be used to improve BMD prior to TKA. However, due to the significantly low amount of screenings for osteoporosis, low BMD goes undetected and untreated in our population. We hypothesize that patients with low bone mineral density will experience higher levels of pain and worse symptoms after a total knee arthroplasty surgery.

Methods: In order to test our hypothesis, we analyzed the correlation between surgical outcomes and BMD on 22 consented osteoarthritis patients undergoing TKA. The status of a patient's surgical outcome is determined by the Knee Osteoarthritis Outcome Scores (KOOS) survey. Each patient takes the KOOS survey before and 90 days after their TKA. In order to examine the BMD of a patient, their tibial plateau was collected during the total knee arthroplasty surgery. The central region of the tibial plateau was imaged using an ex vivo micro-computed tomography scanner (mCT). The software program, CTAn, was used to analyze the BMD from the CT scans. We outlined the regions of interest of the bone scan to include the trabecular bone while excluding the subchondral portion of the tibial plateau. BMD mean values were calculated using hydroxyapatite standards, and we used the Pearson's correlation (r) test to evaluate the strength of the correlation between bone mineral density and the patient's KOOS survey sub scores.

Results: Based on the data which was evaluated between the patient's BMD and their KOOS survey sub scores we must reject our hypothesis. There is no indication from the Pearson's correlation test (r) that patients with low amounts of bone mineral density will experience higher levels of pain or worse symptoms after TKA.

Conclusion: Although this project's data rejects the hypothesis of the connection between bone mineral density and patient pain levels, there are many ways to examine bone quality. Further analysis of a patient's bone quality can be acquired through reviewing bone turnover markers such as Sclerostin (SOST) or by inspecting a patient's trabecular architecture. Discovering the relationship between bone quality and surgical outcomes can encourage the use of certain drugs such as Bisphosphonate to increase a patient's bone mineral density before surgery or even alter TKA procedures based on the patient and their individual screening scores.